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THE USE OF BIOFUELS AND BIOLIQUIDS IN THE EUROPEAN UNION IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT AND FOOD SECURITY'S CONSTRAINTS

CATALIN VOICA¹, CORINA ENE, MIRELA PANAIT

Abstract: *The sectors of transport and energy are at a turning point, which is generated by various factors such as climate change, population growth and its reliance on classic fuels, the necessity of access to modern energy services for the rural population. The solution would be widespread use of renewable sources in final consumption and in transport. Based on these considerations, the authors aim to present their analysis of the situation of the EU market for biofuels and bioliquids. On the one hand, the use of biomass ensures a sustainable approach to energy consumption, but, on the other hand, it raises the issue of food security.*

Keywords : *biofuels, sustainable development, food security, renewable energy*

JEL Classification: Q1, Q2

INTRODUCTION

The climate change generated by the human activities have many socio-economic implications on national economies (Zaman, 2005). Taking in account the amplitude of these implications, many measures have been taken on multiple levels: United Nation Framework Convention on Climatic Changes, Kyoto Protocol or Emission Trading Scheme (ETS) adopted in European Union etc. (Vasile & Balan, 2008). The importance of the energy sector's impact on sustainable development is demonstrated by the efforts made at international level. So, the United Nation launched in 2011 the Strategy Sustainable Energy for All (SE4All) and declared the period of 2014-2024 as the Decade of Sustainable Energy for All. This strategy has three objectives that must meet until 2030: "ensure universal access to modern energy services, double the global rate of improvement in energy efficiency and double the share of renewable energy in the global energy mix" (UN, 2014). Another step was done at the beginning of 2016 by the adoption of energy as a UN Sustainable Development Goal. This goal supposes to ensure the access to affordable, reliable, sustainable and modern energy for all. In fact, this goal has two dimensions: to reduce the carbon intensity of energy and make energy available for everyone (1.1 billion people have no access to electricity). So, energy is considered a "golden thread" that interconnect "the economic growth, social equity and environment" and create complex concept: phenomenon of sustainable development (UN, 2012).

The energy raises two major problems: on the one hand, we notice the limited access to modern energy services in developing countries and rural areas that involves poverty and a low standard of civilization; on the other hand, in developed countries, especially in urban areas, the energy use involves waste and environmental pollution. So, depending on the issues raised by energy use, different strategies for solving the problems are required.

Energy resources have a major impact on sustainable development in view of their use both in households and for producing of goods and services. Renewable energy resources have little or even zero contribution, in some cases, to the greenhouse gas emissions. Despite these advantages, the shift from conventional energy's use to renewable sources is a process lasting and very complex because it involves the appearance of new consumption habits but also generates social problems that must be avoided. (Dusmanescu, 2015).

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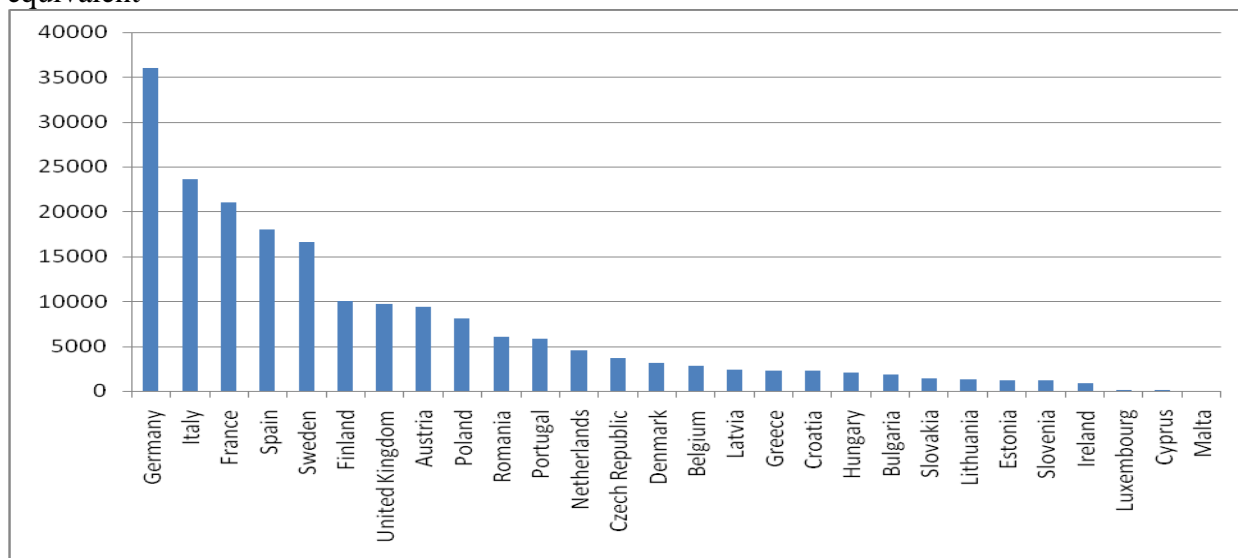
The energy policy is an important instrument used in the European Union in order to face some major challenges like dependency on imported energy and the increase of greenhouse gas emissions in transport sector. To achieve the objectives at EU level, major changes are needed in the structure of the energy sector, the technologies used and consumption habits (Dusmanescu, Andrei & Subic, 2014). A solution to many problems existed in domains like transport, electricity and heating could be the use of biomass based on agricultural crops, wood and wastes. In residential and industrial heating, the use of biomass is a simple and cheap solution. Through the new rules like Directive 2015/1513 of the European Parliament and of the Council, the European authorities encourage the increased use of electricity from renewable sources in transport sector. So, basing economic growth on renewable sources can provide solutions to the challenges generated by the necessity of sustainable development` s promotion (Podasca, 2016).

Renewable energy production in the EU

Renewable energy represents the way to the future for the European Union. In order to catalyze the development of this field, the EU has implemented a system of quotas that must be achieved by 2020 and to get the EU to use 20% of its needed energy from renewable sources. These quotas vary from country to country and ranges from 10% in the case of Malta to 49% in the case of Sweden. In order to achieve their targets, the European member states put in place a system of national action plans in which they report annually the advances that they made towards the target and the changes in policy or any other related problem concerning renewable energy and the predicted path towards the completion of the national goal.

Next, we will provide an objective analysis of the EU primary production of renewable energy by country in the period 2003 – 2014 and the division by type of renewable energy for the year 2014. After we will approach the evolution of biogas, biodiesel and biogasoline production increase in the same period and we will explore the top producers from the EU.

Fig. 1 EU's primary production of renewable energy by country in 2014, 1 000 tones of oil equivalent



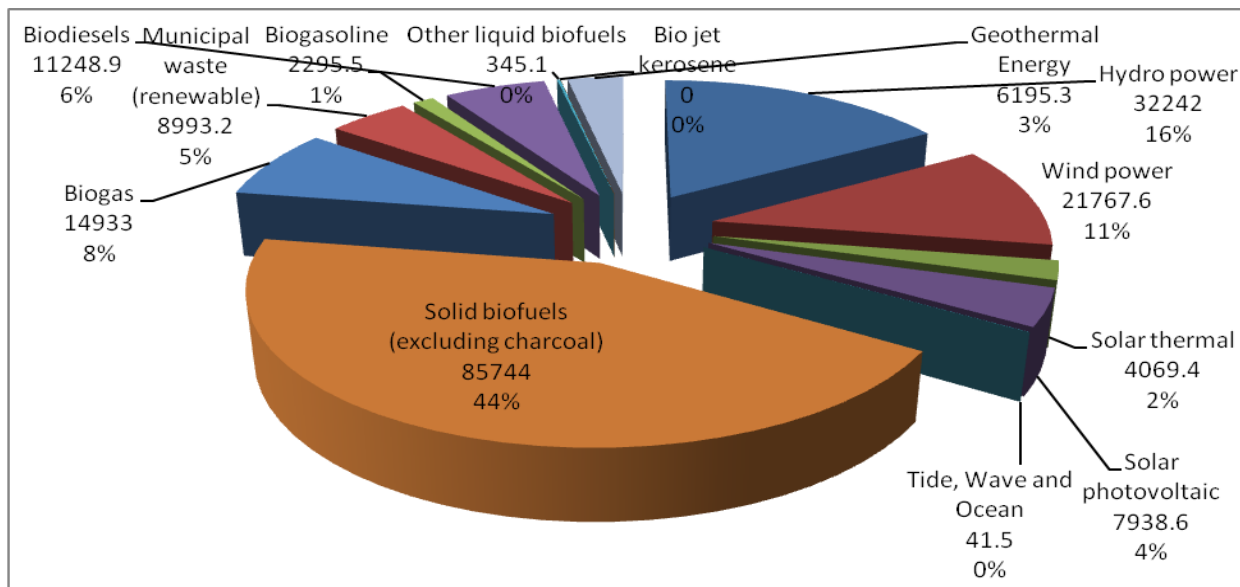
Source: EUROSTAT

In Fig. 1, we observe the primary production of renewable energy by country in the EU in 2014. We can see that Germany is the top producer from renewable sources with 36 017 900 tones of oil equivalent followed by Italy with 23 644 100 tones of oil equivalent, France with 21 002 100 tones of oil equivalent, Spain with 18 002 800 tones of oil equivalent and Sweden with 16 659 800 tones of oil equivalent. The top four countries are the biggest producers of energy in the EU and as

a result they must have a very high level of energy produced from renewable sources in order to achieve their targets of 18% for Germany, 17% for Italy, 23% for France and 20% for Spain.

In the case of Sweden, the target of 49% of energy from renewable energy sources boosts the country to fifth place in the EU. The countries with the lowest production of energy from renewable sources are Luxembourg, Cyprus and Malta which are small countries with a low energy production.

Fig. 2 EU's primary production of renewable energy by type in 2014, 1 000 tones of oil equivalent



Source: EUROSTAT

At EU level, the distribution of primary energy of renewable energy by type in 2014 can be observed in Fig. 2. 44% of the primary energy of renewable sources is produced from solid biofuels (excluding charcoal) with 85 744 000 tones of oil equivalent. We have to acknowledge that the term of solid biofuel can be any biological solid material used as fuel like wood and any byproducts resulted from lumber industry as well as animal dung, municipal waste and energy crops. All these are used for burning in their natural state or as pellets and other forms.

Hydropower represents 16% of the total renewable energy production with 32 242 000 tones of oil equivalent, followed by wind power with 11%, biogas with 8%, solar (thermal + photovoltaic) 6%, biodiesel with 6%, municipal waste with 5%, geothermal with 3% and biogasoline with 1%. The other three types: bio jet kerosene, tide wave and ocean and other liquid biofuels have less than 1% of total primary energy production from renewable sources.

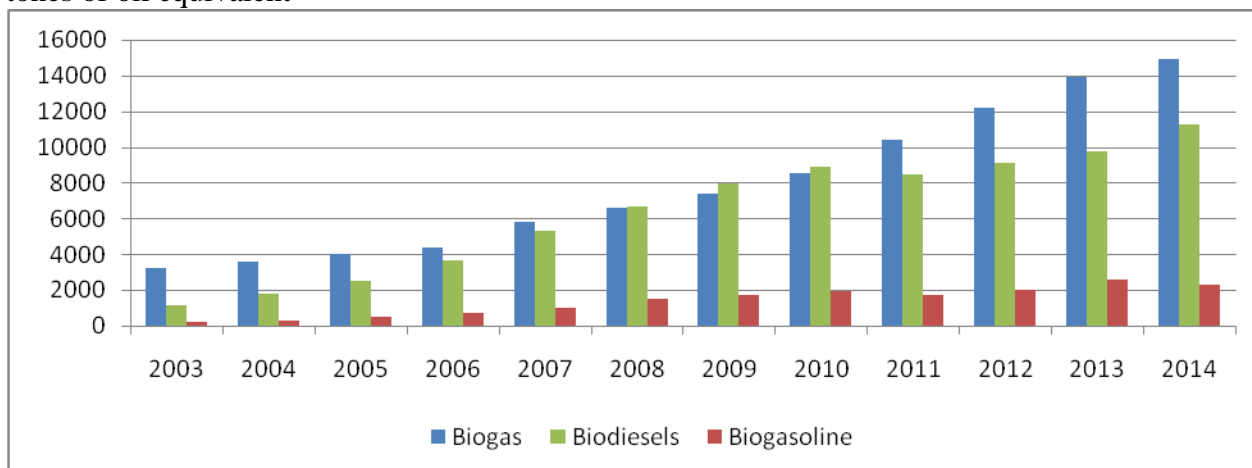
The use of renewable energy is on an ascending trend and continuously developing. The technology is in an effervescent development and as a result new technologies and ways to collect, use or produce renewable energy are discovered. This can generate a step change of the repartition of renewable energy sources. This already happened when the problem of land use has been brought into attention as the biofuels cultures took the place of the food production ones. As a result some restraints were enforced in order to protect the food production.

Biogas, Biodiesels and Biogasoline evolution in the EU

Biogas, biodiesels and biogasoline account for around 15% of the EU's primary production of renewable energy in 2014. This is the result of on-going development and research realized in this field. As we can see in Fig. 3 iIn the period 2003 – 2014 all three types of renewable energy registered an ascendant trend. The biogas production increased 4.6 fold in the analyzed period from

3 227 500 tones of oil equivalent in 2003 to 14 933 000 tones of oil equivalent in 2014. The biodiesel production increased 9.5 fold in the analyzed period from 1 182 700 tones of oil equivalent in 2003 to 11 248 900 tones of oil equivalent in 2014. The biogasoline production increased 9.6 fold in the analyzed period from 239 100 tones of oil equivalent in 2003 to 2 295 500 tones of oil equivalent in 2014. Those trends are closely linked with the evolution of German production which is the largest producer from the EU.

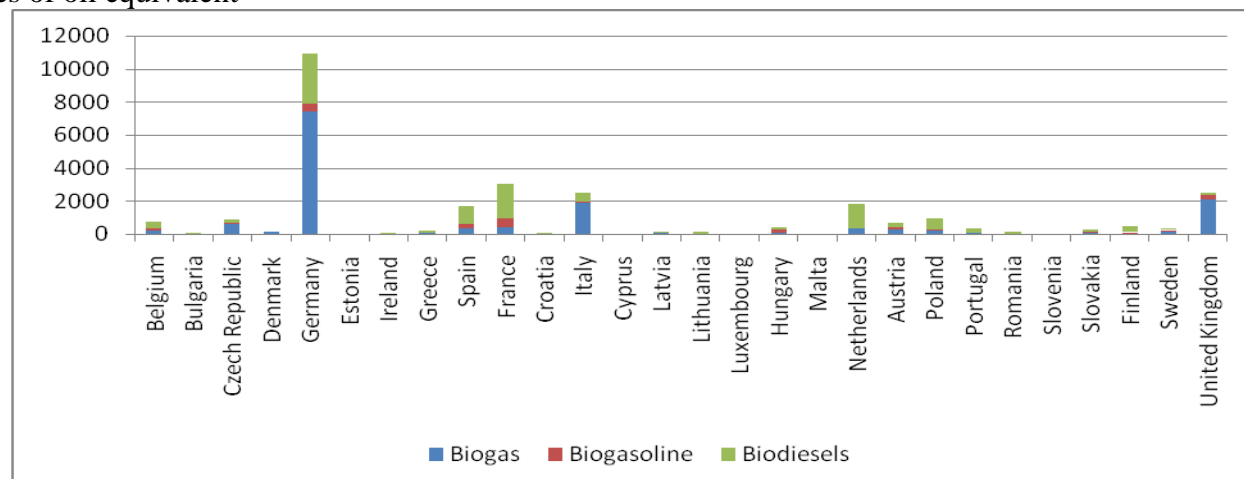
Fig.3 EU's primary production of biogas, biogasoline and biodiesels in 2003-2014, 1 000 tones of oil equivalent



Source: EUROSTAT

In Fig. 4, it can be observed that there are a few countries of which's primary production of biogas, biogasoline and biodiesels are noticeably. Those are Germany, France, Italy, United Kingdom, Netherlands and Spain. In the case of biogas, Germany is the top producer with a production in 2014 of 7 434 300 tones of oil equivalent which is more than the production of the other 27 member states. On the second place, we find United Kingdom with 2 126 400 tones of oil equivalent and Italy with 1 961 000 tones of oil equivalent. In the case of biodiesels, Germany is on the first place, with 3 042 600 tones of oil equivalent followed by France with 2 074 500 tones of oil equivalent, Netherlands with 1 520 00 tones of oil equivalent and Spain with 1 070 800 tones of oil equivalent. In the case of biogasoline production, on the first place, we find France with 492 900 tone of oil equivalent followed by Germany with 449 400 tones of oil equivalent, United Kingdom with 262 700 tones of oil equivalent and Spain with 247 300 tones of oil equivalent.

Fig. 4 EU's primary production of biogas, biogasoline and biodiesels by country in 2014, 1 000 tones of oil equivalent



Source: EUROSTAT

The presented trends in the production of renewable energy in general and biogas, biodiesel biogasoline in special show us that this field is going to develop furthermore in the future. This is promoted by the goal of the EU to achieve a share of 20% consumption of energy from renewable sources by 2020.

Energy vs. Food Security – a Problematic Challenge

In a world still trying to eradicate poverty, hunger and malnutrition, food security encompasses of the right of all people, at any time, to adequate food in the context of national food security and relies on four dimensions - availability, access, stability and utilization (Stancu, 2012). During recent years, the food security issue for the increasing world population re-emerged as a global challenge due to different reasons, including the increasing of non-food uses of agricultural production by producing biofuels, which adds to the impact of climate change on agricultural production and food supply. As agriculture's contribution to energy security through the green alternative is increasing, the actual controversy about the risks of transforming agricultural crops into biofuel crops, as well as on the possible reduction of food availability because of biofuel production can be summarized in the phrase "Food vs. fuel".

As biofuel production has increased significantly in recent years despite many uncertainties still existing on the subject, international discussions revealed various positions, with valid pros and cons (Greve et al., 2012).

Many international reports (Naylor et al. 2007; IFPRI, 2008; Greve et al., 2012; Hamelinck, 2013) estimate that measures to support the biofuels industry will contribute to the price increase for several food raw materials. Increases in food prices will lead to a decrease of the consumption and affect mostly the poorest and vulnerable people in terms of food security (IFPRI, 2008).

Koizumi (2015) shows that increased biofuel production may have a negative impact on food security, but in the same time it can create opportunities for agricultural development; in this context, price elasticity of feedstock supply should be considered a key factor in deciding the contribution of biofuel development on agricultural development.

On the other hand, higher future energy demand and regulations on the reduction of greenhouse gases will lead to increased demand for biofuels.

While first-generation biofuels are produced from valuable food resources (soy, palm, and rapeseed oils; starch and sugar crops) (Spiess, 2013), many specialists consider that a way of limiting the consequences of indirect land use change (ILUC) is switching to fuels of second and third generation, a process that has already begun in developed countries.

Research efforts in this field are currently oriented mainly towards second generation biofuels, which may be obtained from wastes or residues of agricultural crops and are believed that could solve this dilemma (Greve et al., 2012). Though, some authors consider that second generation biofuel impacts remains unclear, depending on production design, policy mechanisms and market context (Thomson & Mayer, 2013).

Addressing all these trends requires urgent research in order to answer a critical question about how global food systems can meet growing food, feed, and fuel needs while contributing to the reduction of poverty and hunger (IFPRI, 2008). To this end, there is an obvious need to properly assess the potential benefits and risks of biofuels and minimize resource degradation and food insecurity while providing income-generating opportunities ("cash crops") for the world's farmers.

Considering that the effects of crop-based biofuels on food security and the environment are not clear enough yet – fact showed by the diversity of opinions on this subject - it is urgent that they are precisely understood soon and taken into account with great care (Naylor, 2007) in designing development and investments policies which have to integrate food security as a major concern (HLPE, 2013).

At global level, this concern was approached on many occasions, international meetings and conferences, where organizations and scientists brought to the light the impact of biofuels on food access, trying to figure out the right way to balance energy needs with the right to food.

In this context, during its 40th Session, in 2013, The Committee on World Food Security (CFS) issued a series of recommendations on biofuels and food security (CFS, 2013). CFS noted that biofuel development involves both economic, social and environmental risks and benefits and is determined by different contributing factors (such as: energy security, climate change mitigation, export markets development, rural development by boosting farm incomes in developed countries (IFPRI, 2008; CFS, 2013)).

Attempting to depict and enhance the current context, CFS highlighted that:

- agricultural commodity prices are influenced by the production and use of biofuels (besides other factors);
- biofuel production could generate a competition between biofuel crops and food crops, which increases the need for policies guidelines in order to minimize the risks biofuels in relation to food security;
- necessary actions should be taken in an integrative way (nationally and internationally);
- governments should coordinate their specific strategies accordingly, by sustainable management of natural resources.

Also, CFS recommended several action points that should be developed and implemented by the appropriate stakeholders (CFS, 2013):

- actions towards enhanced policy coherence for food security and biofuels
- actions to promote Research and Development (R&D) on biofuels and food security
- actions with regard to linkages between energy and food security.

A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security (HLPE) also endorsed several recommendations regarding food security policies and biofuel policies – which mutually interact, stating that the right to food should be priority concerns in the design of any biofuel policy. According to HLPE, governments should adopt a coordinated food security and energy security strategy which would require articulation around the following five axes/dimensions (HLPE, 2013):

1. Adapt to the change to global, market-driven dynamics;
2. Address the land, water and resource implications of biofuel policies;
3. Foster the transition from biofuels to comprehensive food-energy policies;
4. Promote Research and Development;
5. Develop methods and guidelines for coordinated food, biofuels, bio-energy policies at national and international levels.

European Union admits that his policies in this area create additional demand for energy crops, resulting in implications for land use in terms of conversion of agricultural land – including ILUC (Greve et al., 2012), so that public policies lead to increased consumption of biofuels. This will generate a significant increase in GHG emissions. In the same time, crops necessary for biofuels production will occupy food production land, and the latter will move on lands that were occupied by natural areas, causing an increased risk of deforestation and biodiversity loss.

European Commission studies show that ILUC can not be ignored if we do not want European policies on biofuels to have the exact opposite effect than expected.

As a result, this requires taking responsibility for the compliance with the climate change objectives through the implementation of sustainability criteria (Naylor, 2007; Greve et al., 2012).

As a result of environmental NGOs warning that biofuel production jeopardizes food security in some areas and that actual regulations encourages industry expansion, the European law requiring the use of “at least 10% renewable energy in the transport sector from 2020” could be changed.

Citing scientific work on this subject, Marc-Olivier Herman (EU economic justice policy lead, Oxfam International) ardently advocates that “ending support for harmful and costly biofuels

is the only right thing to do” (Herman, 2016), given the biofuels production impact on climate, land and consumers.

Conclusions: the Way to Go - Food Security Comes First

The use of renewable energies is on the rise all over the UE promoted by the 2020 Agenda in which it is stated 20% of the consumption of energy must be obtained from renewable sources. Biofuels and biogas represents 15% of all renewable energy produce in 2014 at the EU level.

The production of biogas and biodiesel is on a strong ascending trend which is supported by EU policy and the goal to transform into a greener economy and to reduce the use of fossil fuels. Another important aspect in the rise of the use of bio-combustibles is that they generate no net carbon dioxide because they absorb as much carbon dioxide in the growing stage as they produce in the energy conversion stage.

Germany is the leader in the bio fuels production in the EU. This can be explain by the fact that Germany is also the largest energy producer from the EU and by the fact that they are converting a lot of their traditional energy production units based on fossil and nuclear fuel into units based on renewable energy sources in order to achieve the 2020 Agenda goal.

Specialists and institutions worldwide begin to understand that the high demand for biofuels could endanger global food security, due to the risks resulting from the production and use of biofuels, as it generates (Dobrescu, 2011): (i) approximately the same degree of pollution as generated by classical fuels; (ii) food price increase; (iii) indirect impoverishment and hunger of a large population, especially in underdeveloped or developing countries.

In order to achieve its targets of reducing CO₂ emissions, the EU actually encouraged the conversion of agricultural land to biofuel crops, thus transferring food crops and pollution to developing countries. Taking into account many voices against biofuels production impact, the Commission understood there is an immediate need for changing regulations in this area.

A solution for the increasingly higher biofuels demand (which could be considered artificially sustained through funding and subsidies) could be productivity growth or marginal and degraded land cultivation, in this way reducing both the indirect impact of land use change and increasing food prices.

As Oxfam study highlights, this growing demand for biofuels must be stopped urgently as it endangers the right to food of millions of people. It is obvious that any development in the field should not compromise food security, and “should especially consider women and smallholders due to their high level of importance in achieving food security, while considering varied national contexts” (CFS, 2013). The biofuels - food security equation is multifaceted and complex and brings forward different specificities at geographic level, needing an integrated and environmentally-based approach in biofuel policy-making and investments. Prospects for this industry should be viewed with caution because the competition between food crops and energy crop could become increasingly fierce .

For the future, in order to ensure that biofuels will not compromise food security, biofuel production should certainly be based on non-food plant feedstock and should not interfere anymore with food and feed production.

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